**RESEARCH PAPER**

# The Analgesic Value of Ultrasound Guided Intraarticular Hyaluronic Acid Compared with Platelet Rich Plasma Injection in Patients with Lumbar Facet Joint Pain Syndrome

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**ABSTRACT**
Background: Lumbar facet joints (FJs) represent a prevalent origin of chronic low back pain; however, they remain poorly understood, frequently misdiagnosed, and often inadequately treated. The objective of this investigation was to juxtapose the analgesic efficacy as well as functional results of ultrasound-guided lumbar facet joint injections using Corticosteroids (CS), hyaluronic acid (HA), and platelet-rich plasma (PRP).
Patients and Methods: This randomized controlled trial included 105 adults with lumbar facet joint pain, allocated into three equal groups receiving ultrasound-guided intra-articular steroid, hyaluronic acid, or PRP injections. Pain (VAS), function (ODI), and patient satisfaction (modified Macnab criteria) were assessed after injection and at 1 week, 1–3 months, 6 months, and 12 months.
Results: Immediately after injection, no meaningful differences were seen between the three groups. Corticosteroids produced quick pain relief that peaked at one month but declined afterward, while hyaluronic acid showed moderate, steady improvement. PRP provided the greatest and longest-lasting pain reduction, with significant benefits from one week up to 12 months, along with the best functional outcomes, highest long-term success and satisfaction, and the lowest need for pain medication
Conclusions: Ultrasound-guided lumbar facet joint injections with PRP in addition to HA provide more prolonged analgesia and enhanced functionality compared with corticosteroid injections. Among the three modalities, PRP demonstrated superior long-term clinical outcomes and patient satisfaction.
**Keywords**: Corticosteroids, Hyaluronic acid, Lumbar facet joint pain, Platelet-rich plasma, Ultrasound-guided injection
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## INTRODUCTION

Chronic low back pain (CLBP) is one of the most prevalent musculoskeletal disorders worldwide and represents a substantial socioeconomic burden. [1] FJs constitute a prevalent origin of chronic low back pain, yet they remain poorly understood, frequently misdiagnosed, and often inadequately treated. [2] Current therapeutic strategies for lumbar facet joint pain include traditional management, interventional procedures, and surgical interventions, with interventional treatments being the most commonly employed. [3]

Facet joint injections traditionally involve the administration of corticosteroids (CS) and local anesthetics via intra-articular, periarticular, or medial branch approaches. CS exerts anti-inflammatory, anti-edematous, and immunosuppressive effects and may inhibit nociceptive transmission within C fibers. Although short-to moderate-duration analgesia is expected due to the presence of inflammatory mediators in degenerative facet joints, the literature reports conflicting evidence regarding the long-term efficacy of corticosteroid injections. [4]

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Platelet-rich plasma (PRP) is an autologous blood-derived substance comprising an elevated concentration of growth factors and cytokines, including platelet-derived growth factor, transforming growth factor-β, fibroblast growth factor, insulin-like growth factor-1, connective tissue growth factor, and epidermal growth factor. These bioactive molecules play a vital role in tissue regeneration and have been increasingly examined for the management of musculoskeletal disorders. [5-7]

Hyaluronic acid (HA) therapy has been extensively studied in osteoarthritis, particularly of the knee, with growing evidence supporting its use in other joints, including the shoulder, hip, and spine. HA is believed to improve joint lubrication, modulate inflammation, and enhance cartilage metabolism. [8]

Despite increasing interest in biologic therapies, direct comparative studies evaluating CS, HA, and PRP for lumbar facet joint pain using ultrasound guidance accompanied by prolonged monitoring remain limited. Therefore, this research aimed to compare the analgesic and rehabilitative effectiveness of Ultrasound (US)-guided lumbar facet joint injections using betamethasone, HA, and PRP among individuals with persistent low back pain attributable to lumbar facet joint syndrome.

**PATIENTS AND METHODS:**

This prospective randomized controlled study was executed on 105 patients of both genders, individuals above the age of 18, diagnosed with lumbar facet joint pain syndrome. The study was executed from July 2021 to January 2025 at the Pain Unit of the Department of Anesthesiology, Surgical Intensive Care, and Pain Medicine, Tanta University Hospitals, Egypt, after approval by the institutional ethics committee (Approval Code: 34754/6/21). Informed permission was obtained in writing from all subjects.

Inclusion Criteria were qualified patients presented accompanied characterized by persistent or sporadic lumbar discomfort more than three months, accompanied by or absent of referred pain to the buttock, groin, or proximal thigh, localized paravertebral discomfort, aggravated by flexion, rotation, or lateral bending, a visual analog scale (VAS) score ≥ 4 stationary, absence of neurological deficits, and radiographic evidence of degenerative alterations of the lumbar facet joints.

Exclusion criteria included patient refusal, radicular symptoms or disc herniation, previous spinal surgery or facet joint intervention, intolerance to study medications, infection, uncorrectable coagulopathy, pregnancy, severe obesity with BMI > 40, unregulated DM, recent CS or opioid use, and negative diagnostic facet joint blocks.

**Randomization:**

Patients were randomly designated to three equivalent groups (n = 35 each) using a computer-generated randomization sequence. Outcome assessors were blinded to group allocation.

**Steroid Group (SG):** US-guided intra-articular injection of 0.5 mL 0.5% bupivacaine combined with 1 mL betamethasone (2 mg sodium phosphate and 5 mg dipropionate).

**HA Group (HG):** US-guided intra-articular injection of 10 mg hyaluronic acid.

**PRP Group (PG):** US-guided intra-articular injection of 0.5 mL autologous PRP.

**Diagnostic Facet Joint Block:**

All patients had a diagnostic US-guided intra-articular facet joint block using 0.5 mL of 2% lidocaine. A decrease in pain of at least 50% during the anesthetic effect was deemed indicative of facet joint discomfort. [9] Each patient required one week for the precise assessment of the legitimacy and complete metabolism of lidocaine after the diagnostic intra-articular block. Selection of diagnostic block levels was based on radiographic evidence of degenerative changes, sites of maximal tenderness on deep palpation, areas eliciting concordant pain during segmental provocation, and clinical judgment. Patients could have unilateral or bilateral involvement and one or multiple affected lumbar facet joints.

**Procedural Technique:**

All procedures were performed in the operating room under standard monitoring, which included ECG, SPO2, and non-invasive blood pressure measurement. An intravenous cannula was inserted, and patients received conscious sedation with midazolam (0.05 mg/kg) immediately before the procedure. All injections were performed by the same experienced operator under US guidance and conducted on an outpatient basis.

Post-procedure, patients were followed for one year to assess treatment efficacy and safety. If post-intervention LBP became intolerable (VAS >4), oral acetaminophen (1 g per dose, not exceeding 1 g every 8 hours) was permitted as rescue analgesia.

**US-Guided Intra-Articular Lumbar Facet Joint Injection:**

Patients were positioned prone. Posterior paravertebral parasagittal US scans were obtained using a curvilinear probe (6-12 MHz; Philips CX50 Extreme) to identify lumbar spinal levels. Transverse scans were then used to visualize the spinous process, lamina, facet joints, mammillary process, and accessory process. The midpoint of the facet joint space was identified as the target.

After skin sterilization with 10% povidone-iodine, local anesthesia was achieved with 3 mL of 2% lidocaine. A 22 G, 3.5-inch spinal needle was advanced under real-time US guidance at an angle of approximately 45° to the axial plane until bony contact within the joint space was confirmed. Correct needle placement was visualized as a linear hyperechoic structure. The assigned injectate was then administered according to group allocation. Figure 1

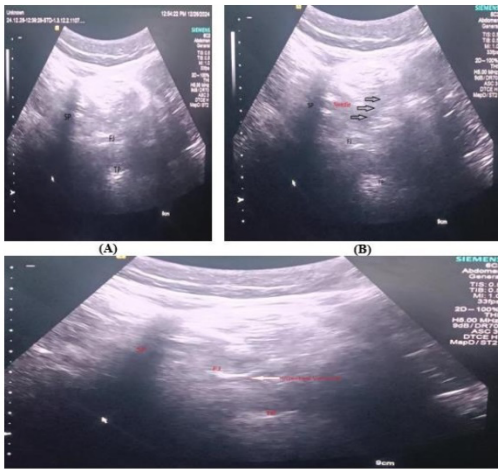


**Figure 1: (A) Sonoanatomy of Facet joint, Ultrasound View of Facet joint (B) Needle in place and (C) After Injection**

**Preparation of Platelet-Rich Plasma:**

Autologous PRP was prepared using a standardized two-step centrifugation technique immediately before injection. A venous blood sample (5–10 mL, depending on the number of treated levels) was collected into sodium citrate anticoagulant tubes under sterile conditions. The first centrifugation was performed at 200×g for 10 minutes at room temperature, separating erythrocytes from plasma containing platelets and leukocytes. The plasma fraction was subsequently centrifuged at 400 × g for 10 minutes to remove platelet-poor plasma. Approximately 1–2 mL of PRP was obtained from the buffy coat and used promptly for injection. Platelet concentration was confirmed to be approximately 4–5 times higher than baseline peripheral blood levels (100–300 $\times 10^9$/mL).

**Measurements:**

Post-treatment pain relief was assessed using VAS (0 to 10) at rest and during back flexion. The analgesic efficacy rate of the above Objective treatment success was determined as 50% at rest. The follow-up time points were conducted immediately thereafter, after 1 week, at 1 month, 2 months, 3 months, 6 months, as well as one year subsequent to therapy. Functional disability was evaluated using the Oswestry Disability Index (ODI), a self-administered questionnaire comprising 10 items addressing pain severity and daily functional activities. Scores were calculated as a percentage of the maximum possible score. [10]

Patient satisfaction was assessed using the modified MacNab criteria, categorized as excellent, good, fair, or poor. Outcomes rated as excellent or good were considered satisfactory. [11]

Analgesic consumption and procedure-related complications, including bleeding, infection, allergic reactions, neurological deficits, and injection-related adverse events, were recorded.

The primary outcome was pain severity measured by VAS at rest and during flexion. Secondary outcomes included ODI scores, patient satisfaction, analgesic use, and complications.

**Statistical Analysis**

Statistical analysis was performed using SPSS version 25. Quantitative data were expressed as mean ± standard deviation or median (interquartile range), as appropriate. Intergroup comparisons were conducted using one-way ANOVA or the Kruskal–Wallis test, with post hoc analysis when indicated. Categorical variables were analyzed using the chi-square test. A two-tailed p-value <0.05 was considered statistically significant.

**RESULTS:**

A total of 167 patients were initially assessed for eligibility. 26 patients were excluded: 8 declined participation, and 18 did not meet the inclusion criteria. The remaining 142 patients were randomly assigned to the three study groups. During follow-up, 11 patients were lost in the steroid group, 8 in the HA group, and 4 in the PRP group. Additionally, failure of diagnostic injection (defined as <50% reduction in VAS from baseline) led to exclusion of 5 patients in the S group and 4 patients in each of the HA and PRP groups. Ultimately, 105 patients (35 per group) completed the study and were included in the final analysis. Figure 2

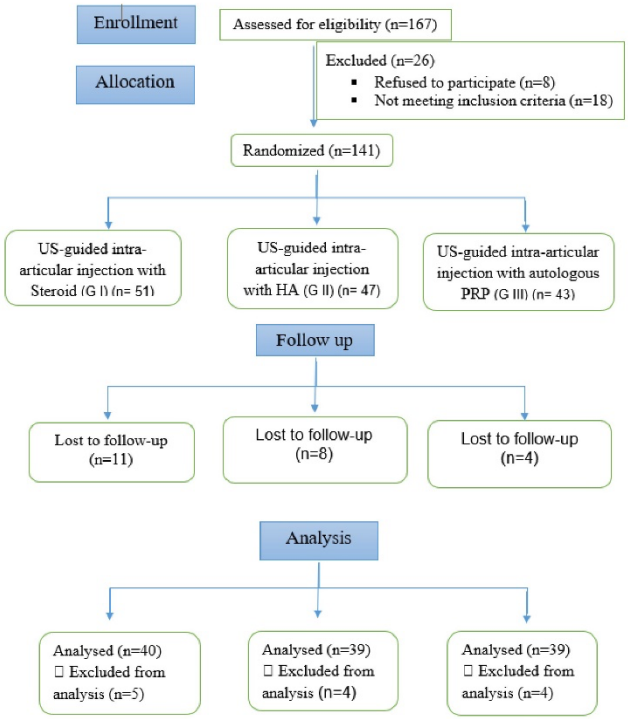


**Figure 2: CONSORT patient flow chart of studied groups**

**Baseline Characteristics**

There were no statistically significant differences among the three groups regarding age, sex distribution, BMI, or duration of pain at baseline. Table 1

Baseline VAS scores at rest and during flexion, as well as ODI scores, were also comparable across groups.

Before injection, mean VAS scores did not differ significantly among the three groups. Similarly, no significant intergroup differences were observed immediately after injection or at the 2-month follow-up.

At one week post-injection, VAS scores showed a statistically significant difference among groups ($P < 0.001$). Pairwise comparisons revealed significant differences between the S and PRP groups and between the

HA and PRP groups, while no significant difference was detected between the S and HA groups.

At one month, significant differences in VAS scores were observed among the three groups ($P < 0.001$), with pairwise comparisons demonstrating significant differences between the S and HA, S and PRP, and HA and PRP groups.

At three months, intergroup differences in VAS remained statistically significant ($P < 0.001$). Significant differences were identified between the S and PRP groups and between the HA and PRP groups, whereas no significant difference was observed between the S and HA groups.

At six months, VAS scores differed significantly among the three groups ($P = 0.004$), with significant differences between the S and HA, steroid and PRP, and HA and PRP groups. At 12 months, VAS scores again demonstrated highly significant differences among groups ($P < 0.001$), with all pairwise comparisons showing statistical significance. Table 2

Baseline VAS scores during flexion did not differ significantly among groups. Immediately after injection, no significant intergroup differences were observed.

At one week, VAS during flexion showed a significant difference among the three groups ($P = 0.001$), with significant differences between the S and PRP groups, and between the HA and PRP groups. No difference was found between the S and HA groups.

At one month, intergroup differences remained significant ($P < 0.001$), with all pairwise comparisons showing statistical significance. At two months, no statistically significant differences were observed among groups.

At three months, VAS during flexion again differed significantly among groups ($P < 0.001$), with significant differences between S and PRP and between HA and PRP groups. At both six and 12 months, VAS during flexion demonstrated highly significant differences among groups ($P < 0.001$), with all pairwise comparisons showing statistical significance. Table 2

Before intervention, ODI scores were comparable among the three groups ($P = 0.571$). At one week post-injection, a statistically significant difference in ODI scores was observed among groups ($P < 0.001$), with significant differences between the S and HA groups and between the S and PRP groups, while no significant difference was found between PRP and HA groups.

At one month, ODI scores continued to differ significantly among the three groups ($P < 0.009$), with significant differences across all pairwise comparisons. At two months, no statistically significant intergroup differences were detected.

At three months, ODI scores again showed significant differences among groups ($P < 0.001$), with significant differences between S and HA and between S and PRP groups, while no significant difference was found between PRP and HA groups.

At six months and 12 months, ODI scores demonstrated persistent significant differences among the three groups ($P < 0.009$), with all pairwise comparisons showing statistical significance, favoring the PRP group. Table 3

Immediately after injection, none of the patients in any group achieved treatment success (VAS ≤50% of baseline). At one week, treatment success was observed in two patients (5.7%) in the S group only.

At one month, all patients in the S group achieved treatment success (100%), compared with 82.9% in the HA group and 17.1% in the PRP group. At two months, success rates were 68.6% in the steroid group, 85.7% in the HA group, and 71.4% in the PRP group.

At three months, treatment success declined to 42.9% in the S group, compared with 60% in the HA group and 100% in the PRP group. At six months, success was achieved in 5.7% of S patients, 31.4% of HA patients, and 74.3% of PRP patients. At 12 months, successful outcomes were observed exclusively in the PRP group (28.6%). Table 4

Analgesic requirements differed significantly among groups at most follow-up intervals. At one week and one month, analgesic use was highest in the PRP group, followed by the HA group, and lowest in the S group. However, from three months onward, analgesic consumption increased markedly in the S group, while remaining lowest in the PRP group at six and 12 months. Table 4

Patient satisfaction assessed using the modified MacNab criteria demonstrated significant intergroup differences at one week, six months, and 12 months. Early satisfaction favored the steroid group, whereas long-term satisfaction was significantly higher in the PRP group. At 12 months, the majority of patients in the PRP group reported good to excellent outcomes, while dissatisfaction was highest in the S group. Table 4

No major complications such as infection, neurological deficits, or serious adverse events were reported in any group.

**Table 1. Comparison of the three analyzed groups based on demographic data**

| | | Group I (n = 35) | Group II (n = 35) | Group III (n = 35) | Test | p |
|---|---|---|---|---|---|---|
| Age (years) | | 47.06 ± 8.48 | 46.43 ± 7.84 | 47.54 ± 7.35 | F= 0.175 | 0.840 |
| BMI | | 32.46 ± 3.52 | 32.20 ± 3.81 | 32.17 ± 3.44 | F= 0.067 | 0.935 |
| Pain duration | | 22.66 ± 4.43 | 22.63 ± 4.35 | 23.46 ± 4.06 | F= 0.423 | 0.656 |
| Sex | Male | 14(40%) | 16 (45.7%) | 17(48.6%) | $\chi2$=0.539 | 0.764 |
| | Female | 21(60.0%) | 19 (54.3%) | 18(51.4%) | | |

Data are presented as mean ± SD, and frequency (%), SD: Standard deviation, F: F for One way ANOVA test, $\chi2$: Chi square test, pairwise comparison between each 3 groups was done using Post Hoc Test (Tukey), p: p value for comparing between the three studied groups, Group I: Steroid (SG), Group II: Hyaluronic acid (HG) and Group III: Platelet-rich plasma (PG).

**Table 2. Comparison between the three studied groups according to VAS, and VAS changes at Flection**

| | Group I (n=35) | Group II (n=35) | Group III (n=35) | H | p |
|---|---|---|---|---|---|
| VAS | | | | | |
| Before | 6.51 ± 0.95 | 6.71 ± 1.13 | 6.60 ± 1.03 | 0.521 | 0.771 |
| After immediately 1 week | 5.83 ± 0.92 | 6.14 ± 1.06 | 6.34 ± 0.87 | 4.568 | 0.102 |
| | 4.74 ± 1.01 | 4.97 ± 0.95 | 5.63 ± 0.84 | 15.616* | <0.001* |
| Sig. bet. grps | P1=0.380, P2<0.001*, P3=0.004* | | | | |
| 1month | 2.34 ± 0.68 | 2.97 ± 0.92 | 4.26 ± 0.89 | 49.891* | <0.001* |
| Sig. bet. grps | P1=0.018*, P2<0.001*, P3<0.001* | | | | |
| 2month | 2.94 ± 0.80 | 2.97 ± 0.75 | 3.09 ± 0.85 | 0.896 | 0.639 |
| 3months | 3.77 ± 1.11 | 3.54 ± 0.74 | 2.06 ± 0.73 | 46.715* | <0.001* |
| Sig. bet. grps | P1=0.611, P2<0.001*, P3<0.001* | | | | |
| 6months | 5.09 ± 1.17 | 4.11 ± 0.83 | 2.94 ± 0.80 | 51.404* | <0.001* |
| Sig. bet. grps. | P1=0.004*, P2<0.001*, P3<0.001* | | | | |
| 12months | 6.60 ± 1.03 | 5.60 ± 0.91 | 4.34 ± 0.91 | 51.496* | <0.001* |
| Sig. bet. grps | P1=0.002*, P2<0.001*, P3<0.001* | | | | |
| FLEX | | | | | |
| Before | 7.66 ± 0.91 | 7.71 ± 1.13 | 7.63 ± 1.09 | 0.089 | 0.628 |
| After immediately | 6.80 ± 1.02 | 7.11 ± 1.05 | 7.26 ± 1.01 | 2.666 | 0.264 |
| 1 week | 5.71 ± 0.96 | 6.06 ± 0.94 | 6.60 ± 0.85 | 14.566* | 0.001* |
| Sig. bet. grps. | P1=0.200, P2<0.001*, P3=0.013* | | | | |
| | 2.89 ± 0.87 | 3.89 ± 1.02 | 4.91 ± 0.92 | 46.290* | <0.001* |
| Sig. bet. grps. | P1=0.001*, P2<0.001*, P3=0.001* | | | | |
| 2month | 3.37 ± 0.84 | 3.34 ± 0.87 | 3.69 ± 0.83 | 5.233 | 0.073 |
| 3months | 4.20 ± 1.23 | 3.91 ± 0.98 | 2.43 ± 0.81 | 40.874* | <0.001* |
| Sig. bet. grps. | P1=0.515, P2<0.001*, P3<0.001* | | | | |
| 6months | 6.06 ± 1.03 | 4.94 ± 0.94 | 3.80 ± 0.96 | 51.638* | <0.001* |
| Sig. bet. grps. | P1<0.001*, P2<0.001*, P3<0.001* | | | | |
| 12months | 7.71 ± 0.86 | 6.54 ± 0.95 | 5.37 ± 0.97 | 55.015* | <0.001* |
| Sig. bet. grps | P1<0.001*, P2<0.001*, P3<0.001* | | | | |

SD: Standard deviation, H: H for Kruskal Wallis test, pairwise comparison bet. each 2 groups was done using Post Hoc Test (Dunn's for multiple comparisons test)p: p value for comparing between the three studied groups in each periods, p1: p value for comparing between Group I and Group II, p2: p value for comparing between Group I and Group III, p3: p value for comparing between Group II and Group III*: Statistically significant at $p \leq 0.05$ , Group I: Steroid (SG), Group II: Hyaluronic acid (HG) and Group III: Platelet-rich plasma (PG).

**Table 3: Comparison of the three groups based on ODQ scores**

| ODI | Group I (n = 35) | Group II (n = 35) | Group III (n = 35) | F | P |
|---|---|---|---|---|---|
| Before | 53.69 ± 6.56 | 52.09 ± 6.13 | 53.0 ± 6.28 | 0.563 | 0.571 |
| 1 week | 39.80 ± 5.68 | 43.63 ± 5.23 | 44.49 ± 5.33 | 7.426* | 0.001* |
| Sig. bet. grps. | P1=0.011*, P2=0.001*, P3=0.786 | | | | |
| 1month | 26.71 ± 6.37 | 33.23 ± 6.0 | 37.74 ± 6.37 | 27.532* | <0.001* |
| Sig. bet. grps. | p1<0.001*, P2<0.001*, P3=0.009* | | | | |
| 2month | 30.60 ± 6.14 | 28.20 ± 5.25 | 31.40 ± 6.01 | 2.874 | 0.061 |
| 3months | 36.06 ± 7.0 | 27.54 ± 5.08 | 24.97 ± 4.52 | 37.146* | <0.001* |
| Sig. bet. grps. | P1<0.001*, P2<0.001*, P3=0.141 | | | | |
| 6months | 42.80 ± 7.10 | 33.46 ± 4.98 | 30.17 ± 4.64 | 46.563* | <0.001* |
| Sig. bet. grps. | P1<0.001*, P2<0.001*, P3=0.045* | | | | |

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|---|---|---|---|---|---|
| 12months | 52.40 ± 6.69 | 43.71 ± 5.47 | 36.26 ± 4.55 | 71.784* | <0.001* |
| Sig. bet. grps. | P1<0.001*, P2<0.001*, P3<0.001* | | | | |

SD: Standard deviation, F: F for One way ANOVA test, pairwise comparison bet. each 2 groups was done using Post Hoc Test (Tukey), p: p value for comparing between the three studied groups in each periods, p1: p value for comparing between Group I and Group II, p2: p value for comparing between Group I and Group III, p3: p value for comparing between Group II and Group III, *: Statistically significant at $p \leq 0.05$ , Group I: Steroid (SG) , Group II: Hyaluronic acid (HG) and Group III: Platelet-rich plasma (PG).

**Table 4: Comparison among the three groups analyzed based on successes rate, patients need analgesia, and patient's satisfaction**

| | | Group I (n = 35) | | Group II (n = 35) | | Group III (n = 35) | | $\chi 2$ | P |
|---|---|---|---|---|---|---|---|---|---|
| | | No (%) | | No. % | | No (%) | | | |
| Successes rate | | | | | | | | | |
| Immediately | | 0 (0.0) | | 0 (0.0%) | | 0 (0.0%) | | – | – |
| 1 week | | 2 (5.7%) | | 0 (0.0%) | | 0(0.0%) | | 2.706 | MCp=0.327 |
| 1 month | | 35(100%) | | 29(82.9%) | | 6(17.1%) | | 60.257* | <0.001* |
| Sig. bet. grps. | | FEP1=0.025*, P2<0.001*, P3<0.001* | | | | | | | |
| 2 months | | 24(68.6%) | | 30(85.7%) | | 25(71.4%) | | 3.169 | 0.205 |
| 3 months | | 15(42.9%) | | 21(60.0%) | | 35(100.0%) | | 27.490* | <0.001* |
| Sig. bet. grps. | | P1=0.151, P2<0.001*, P3<0.001* | | | | | | | |
| 6 months | | 2(5.7%) | | 11(31.4%) | | 26(74.3%) | | 35.979* | <0.001* |
| Sig. bet. grps. | | P1=0.006*, P2<0.001*, P3<0.001* | | | | | | | |
| 12 months | | 0(0.0%) | | 0(0.0%) | | 10(28.6%) | | 22.105* | MCp<0.001* |
| Sig. bet. grps. | | P1= –,P2=0.001*, P3=0.001* | | | | | | | |
| Patients need analgesia | | | | | | | | | |
| 1 week | | 15(42.9%) | | 22(62.9%) | | 32(91.4%) | | 18.514* | <0.001* |
| Sig. bet. grps. | | P1=0.094, P2<0.001*, P3=0.004* | | | | | | | |
| 1 month | | 1(2.9%) | | 6(17.1%) | | 14(40.0%) | | 15.357* | <0.001* |
| Sig. bet. grps. | | FEP1=0.106, P2<0.001*, P3=0.034* | | | | | | | |
| 2 months | | 5(14.3%) | | 3(8.6%) | | 6(17.1%) | | 1.190 | MCp=0.679 |
| 3 months | | 11(31.4%) | | 3(8.6%) | | 1(2.9%) | | 13.067* | 0.001* |
| Sig. bet. grps. | | P1=0.017*, P2=0.002*, FEP3=0.614 | | | | | | | |
| 6 months | | 26(74.3%) | | 17(48.6%) | | 6(17.1%) | | 23.036* | <0.001* |
| Sig. bet. grps. | | P1=0.027*, P2<0.001*, P3=0.005* | | | | | | | |
| 12 months | | 35(100.0%) | | 31(88.6%) | | 16(45.7%) | | 33.515* | <0.001* |
| Sig. bet.grps | | FEP1=0.114, P2<0.001*, P3<0.001* | | | | | | | |
| | | Group I (n = 35) | | Group II (n = 35) | | Group III (n = 35) | | $\chi 2$ | p |
| Patients satisfaction | | | | | | | | | |
| 1 week | Excellent | 2(5.7%) | | 0(0.0%) | | 0(0.0%) | | 12.815* | MCp= 0.025* |
| | Good | 25(71.4%) | | 26(74.3%) | | 15(42.9%) | | | |
| | Fair | 6(17.1%) | | 6(17.1%) | | 15(42.9%) | | | |
| | Poor | 2(5.7%) | | 3(8.6%) | | 5(14.3%) | | | |
| | Sig. bet. grps. | MCp1=0.784, MCp2=0.018*,MCp3=0.022* | | | | | | | |
| 1 month | Excellent | 34 | 97.1 | 25 | 71.4 | 6 | 17.1 | 54.211* | MCp <0.001* |
| | Good | 1 | 2.9 | 8 | 22.9 | 27 | 77.1 | | |
| | Fair | 0 | 0.0 | 2 | 5.7 | 2 | 5.7 | | |
| | Poor | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | | |
| | Sig. bet. grps. | MCp1=0.008*,MC p2<0.001*, MCp3<0.001* | | | | | | | |
| 2 months | Excellent | 25(71.4%) | | 31(88.6%) | | 24(68.6%) | | 4.515 | 0.105 |
| | Good | 10(28.6%) | | 4(11.4%) | | 11(31.4%) | | | |
| | Fair | 0(0.0%) | | 0(0.0%) | | 0(0.0%) | | | |
| | Poor | 0(0.0%) | | 0(0.0%) | | 0(0.0%) | | | |
| 3 months | Excellent | 16(45.7%) | | 19(54.3%) | | 33 | 94.3 | 23.157* | MCp <0.001* |
| | Good | 18(51.4%) | | 15(42.9%) | | 2 | 5.7 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Fair | 1(2.9%) | 1(2.9%) | 0 | 0.0 | | |
| | Poor | 0(0.0%) | 0(0.0%) | 0 | 0.0 | | |
| | Sig. bet. grps. | MCp1=0.815, MCp2<0.001*,MCp3<0.001* | | | | | |
| 6 months | Excellent | 2(5.7%) | 8(22.9%) | 14(40.0%) | | 23.777* | MCp <0.001* |
| | Good | 21(60.0%) | 23(65.7%) | 21(60.0%) | | | |
| | Fair | 8(22.9%) | 4(11.4%) | 0(0.0%) | | | |
| | Poor | 4(11.4%) | 0(0.0%) | 0(0.0%) | | | |
| | Sig. bet. grps. | MCp1=0.026*,MCp2<0.001*,MCp3=0.058 | | | | | |
| 12 months | Excellent | 0(0.0%) | 0(0.0%) | 1(2.9%) | | 34.532* | MCp <0.001* |
| | Good | 6(17.1%) | 16(45.7%) | 26(74.3%) | | | |
| | Fair | 14(40.0%) | 13(37.1%) | 8(22.9%) | | | |
| | Poor | 15(42.9%) | 6(17.1%) | 0(0.0%) | | | |
| | Sig. bet. grps. | p1=0.015*, MCp2<0.001*, MCp3=0.007* | | | | | |

$\chi 2$: Chi square test, FE: Fisher Exact test, MC: Monte Carlo tests, p: p value for comparing between the two studied groups, p1: p value for comparing between Group I and Group II, p2: p value for comparing between Group I and Group III, p3: p value for comparing between Group II and Group III, *: Statistically significant at $p \leq 0.05$ , Group I: Steroid (SG), Group II: Hyaluronic acid (HG) and Group III: Platelet-rich plasma (PG).

**DISCUSSION:**

CLBP represents one of the most prevalent musculoskeletal disorders worldwide and is associated with substantial disability, reduced productivity, and impaired quality of life. LFJ syndrome accounts for a considerable proportion of CLBP cases; however, its management remains challenging due to the multifactorial nature of pain and the limited durability of conventional therapeutic modalities.

The CS group showed rapid and significant pain relief immediately after injection, reaching maximal improvement at one month. This early response is likely due to the potent anti-inflammatory effects of CS combined with the short-term analgesic action of the local anesthetic. However, the therapeutic benefit gradually diminished after three months and was not sustained at one year. These results align with those of Schulte et al. [12] who provided the report satisfactory pain relief after facet joint CS injections at one month, with diminishing effects at three and six months. Similarly, Cohen et al. [13] demonstrated superior short-term pain relief following intra-articular CS injections compared with medial branch blocks or saline, emphasizing the short-lived efficacy of CS in facet-mediated pain. Although Ribeiro et al. [14] reported steroid benefits lasting up to 24 weeks, the overall body of evidence supports the limited long-term efficacy of CS injections, consistent with the outcomes of the current investigation.

In contrast, PRP injections demonstrated a delayed yet progressive and sustained improvement in both pain and functional outcomes. In the present study, significant reductions in VAS and ODI scores were observed as early as one-week post-injection and persisted throughout the one-year follow-up period, with peak efficacy at three months. This durable therapeutic effect may be attributed to the biological properties of PRP, which contains a high concentration of growth factors and cytokines that modulate inflammation, promote tissue regeneration, and enhance synovial healing. These results are present strong contract in conjunction with prior research conducted by Wu et al. [15, 16], who reported progressive reductions in pain and disability following PRP facet joint injections, with PRP outperforming CS at later follow-up points. Similarly, Singla et al. [17] and Cauchon et al. [18] demonstrated superior medium- and long-term outcomes for PRP compared with CS, particularly regarding sustained pain relief and functional recovery.

Furthermore, the reduced analgesic consumption and higher long-term patient satisfaction the findings of the PRP group in the present research align with reports by Kirchner et al. [19] and Singh et al. [20], who highlighted PRP's ability to furnish durable indication control and enhance quality of life. Nevertheless, some studies have reported conflicting results. Xuan et al. [21], in a systematic review, discovered none significant difference among PRP as well as CS in objective pain scores, Despite increased patient satisfaction in the PRP group. Likewise, Allison et al. [22] reported comparable outcomes between low-concentration PRP as well as CS in cervical facetogenic pain. These discrepancies may be attributed to variations in PRP preparation protocols, plate let concentration, injection techniques, spinal region targeted, and follow-up duration.

HA injections in the current study resulted in significant pain reduction and functional progress from the first week to one year, with peak benefit observed at two months. The sustained effect of HA may be related to its viscoelastic properties, its role in restoring synovial fluid homeostasis, and its protective effect on articular cartilage. These findings are congruent with those of Fuchs et al. [23], who conveyed that HA provided comparable or superior long-term outcomes to CS in lumbar facet joint arthropathy. Similarly, DePalma et al. [24] demonstrated improvements in pain and functionality for a duration of up to six months following HA injections, with a gradual decline thereafter.

However, not all studies support the effectiveness of HA in facet joint pain. Cleary et al. [25] reported no significant improvement following HA injections, though they're the research was constrained by a limited sample size and absence of randomization. Additionally, a systematic review by Ambrosio et al. [26] discovered none significant difference among HA as well as CS concerning pain relief or patient satisfaction, highlighting the heterogeneity of dosing regimens and injection protocols across studies. All treatment modalities in this study demonstrated favorable safety profiles, with only minor and transient adverse effects reported. The use of ultrasound guidance likely

contributed to the low complication rates by improving procedural accuracy and avoiding exposure to ionizing radiation. These findings align with previous studies, including Touboul et al. [27], which confirmed US-guided lumbar facet joint injections demonstrate comparable efficacy and safe as fluoroscopy-guided techniques.

Despite its strengths, this study has certain limitations. The use of a single diagnostic block, rather than dual blocks, may have increased the risk of false-positive diagnoses. Moreover, standardized protocols for PRP and HA preparation and dosing are lacking, which could limit the generalizability of the findings. Future large-scale randomized controlled trials with standardized biologic preparation methods and longer follow-up periods are warranted.

**Conclusions:**

US guided lumbar facet joint injections using PRP and HA provide more durable pain relief and functional improvement compared with CS injections. PRP demonstrated the most favorable long-term outcomes promotes patient contentment, reinforcing its function as an effective treatment option for chronic lumbar facet joint pain.

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**Conflicts of interest:**

There are no conflicts of interest.

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